

# **Impact of the New Standard Reinsurance Agreement (SRA) on Multi-Peril Crop Insurance (MPCI) Gain and Loss Probabilities**

**Oscar Vergara<sup>1</sup>**  
([overgara@air-worldwide.com](mailto:overgara@air-worldwide.com))

**Jack Seaquist**  
([jseaquist@air-worldwide.com](mailto:jseaquist@air-worldwide.com))

**Gerhard Zuba**  
([gzuba@air-worldwide.com](mailto:gzuba@air-worldwide.com))

**Matt Harrigan**  
([mharrigan@air-worldwide.com](mailto:mharrigan@air-worldwide.com))

**Eric Lee**  
([elee@air-worldwide.com](mailto:elee@air-worldwide.com))

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<sup>1</sup> Corresponding Author

AIR Worldwide Corporation, 131 Dartmouth Street, Boston, MA 02116



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## Contact Information

If you have any questions regarding this document, contact:

Oscar Vergara  
AIR Worldwide  
131 Dartmouth Street  
Boston, MA 02116-5134  
USA  
Tel: (617) 954-1906  
Email: [overgara@air-worldwide.com](mailto:overgara@air-worldwide.com)

## Introduction

The United States Department of Agriculture’s Risk Management Agency (RMA) offers protection to crop insurers in the form of the Standard Reinsurance Agreement (SRA), allowing them to transfer risk to the government by sharing specified levels of underwriting gains and losses. The 2008 Farm Bill enacted by Congress allowed the RMA to renegotiate the SRA for the 2011 crop year and beyond, replacing the previous version from 2005.

The changes, which were crystalized just this year, are significant and structural. One result is that reliance on historical loss ratios for estimating gains and losses for the coming year—which has always been problematical at best—is now even more ill-advised. It was in recognition of the limitations of the historical data that AIR developed probabilistic modeling techniques for estimating agricultural risk.

The AIR Multiple Peril Crop Insurance (MPCI) Model for the United States is a weather-based crop insurance risk model that estimates underwriting gains and losses based on crop yield probabilities in the context of current conditions, including agricultural technology, price volatility, crop insurance policy terms and premium rates, farmer planting and insurance purchasing patterns, and terms of the government’s Standard Reinsurance Agreement (SRA). AIR updates the model each year to include the latest data on each of these.

This year, the AIR model will reflect the changes to the Standard Reinsurance Agreement—changes that will have a substantial impact on MPCI profitability and risk. In this paper, we examine the motivation behind the change and its impact on MPCI industry gain and loss potential.

## AIR MPCI Model Overview

The AIR MPCI Model (Figure 1) provides fully probabilistic, county-level crop insurance loss analysis for each major crop, policy type and coverage level. The model is based on high resolution historical weather and soil data and the unique AIR Weather Index (AWI), which isolates the effects of weather on crop yields from the long term trend introduced by technological advances in farming. The resulting detrended yield probabilities provide significantly improved risk estimates.

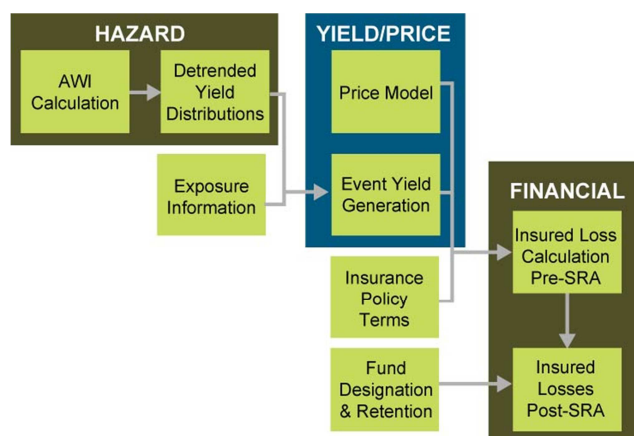
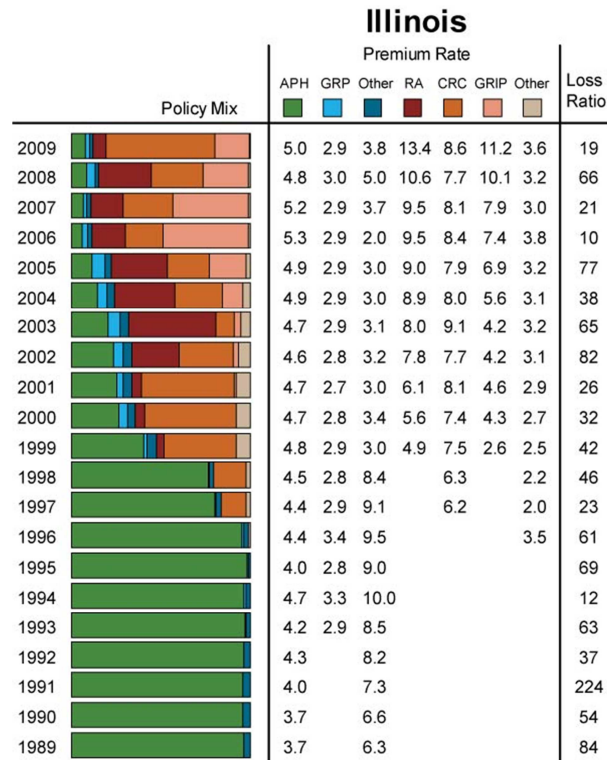


Figure 1. Components of the AIR Multiple Peril Crop Insurance Model for the U.S.

Market price volatility, a critical factor in revenue-based insurance policies, is captured in the yield/price component of the AIR model. Incorporated in this component of the model are the most recent insurance premium rates, selection of policy types, crop planting decisions, and USDA-specified loss thresholds. Because premium rates by policy type and the mix of policy types have changed significantly over the years, historical loss ratios are less relevant for determining potential losses for an upcoming year (see Figure 2).



**Figure 2. Policy mix and premium rates can change dramatically from year to year, as shown here for the state of Illinois**

The AIR MPCl Model is updated annually to incorporate new data applicable to the upcoming crop year, and periodically to reflect model enhancements. For the 2011 crop growing season, these updates include:

- Crop yield data at the county level from the National Agricultural Statistics Service (NASS) for the 2008 growing season;
- AWI values reflecting daily weather observations through 2008 are used to revise the technology trends at the county level by crop, and county-level crop yield distributions were reestimated to reflect the 2009 industry exposure;
- Industry exposure data through 2009 based on the latest information from the Risk Management Agency (RMA), including industry premiums, policy type purchases, planted acreage, and SRA fund allocations;
- Updated pricing model to reflect data up to 2009 and refined to improve the modeling of current price volatility;

- Support for the new Combo insurance policy type, replacing the traditional Revenue Insurance policies;
- Enhanced relationship between losses from non-modeled crops and losses from detailed (through AWI) modeled crops, and for losses due to prevented planting.

These changes allow for the most up-to-date analysis of MPCl risk in 2011. However, for 2011 there is an additional model update that reflects the significant changes made by the RMA to the SRA for the upcoming and subsequent seasons.

## The 2011 Standard Reinsurance Agreement

### Motivation and Goals

The 2011 changes to the SRA are intended to reduce the overall expense to the government by decreasing administrative and operating (A&O) reimbursements, and by increasing the government's share of underwriting gains. (Recently, the A&O expense reimbursement grew substantially because of their link to commodity prices; there was no equivalent increase in delivery costs for crop insurance companies.)

Another major objective in the 2011 SRA is to improve farmers' access to the federal crop insurance program by encouraging insurers to operate in states outside the Corn Belt where the market is deemed to be underserved. The Corn Belt has been the most profitable region for crop insurance companies; production losses for corn and soybeans have historically occurred only infrequently, though when they do occur they are likely to be of high severity (for example, the result of a large flood or drought approximately every 10–15 years).

Under the previous SRA, companies earned significant returns during the good years, while the government picked up most of the extreme losses in the infrequent bad years. By contrast, many other regions experience high frequency/low severity production loss patterns, which were far less profitable for companies because they experience more frequent losses, leaving few years with the high gains that are attractive to a crop insurer.

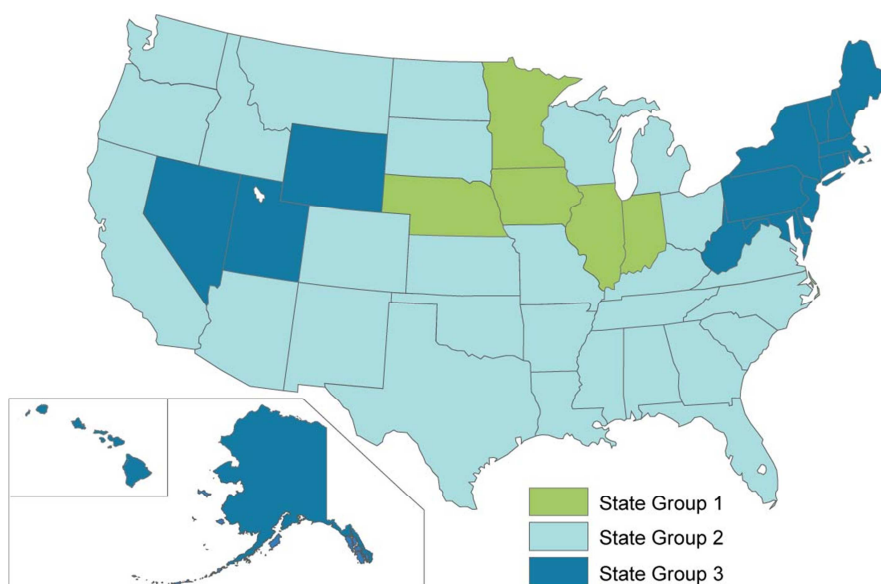
With the new SRA, the RMA aims to equalize the servicing of crop insurance across all regions of the country, regardless of the expected pattern of production losses. At the same time, the RMA expects that companies that conduct business in the Corn Belt will continue to make reasonable underwriting profits. Finally, the new proposed structure of the SRA is designed to reduce volatility, giving the companies more predictable and more uniform earnings rates.

### State Groupings

In the 2011 SRA, the states are divided into groups according to historical underwriting performance. This provision seeks to better balance reinsurance performance geographically and to provide companies with a financial incentive to sell and service currently underserved areas. Group 1 represents the five states with the highest levels of expected return under the current SRA. Under the 2011 SRA, Groups 2 and 3 are designated



to benefit from greater profit potential and lower risk compared to the current SRA and compared to Group 1 states. Figure 3 shows the state groupings under the new SRA.



**Figure 3. State Groupings**

State Group 1 includes Illinois, Indiana, Iowa, Minnesota, and Nebraska.

State Group 2 includes Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Kansas, Louisiana, Michigan, Missouri, Mississippi, Montana, North Carolina, North Dakota, New Mexico, Oklahoma, Kentucky, Ohio, Oregon, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, and Wisconsin.

State Group 3 includes Alaska, Connecticut, Delaware, Hawaii, Maine, Maryland, Massachusetts, Nevada, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Utah, Vermont, West Virginia, and Wyoming.

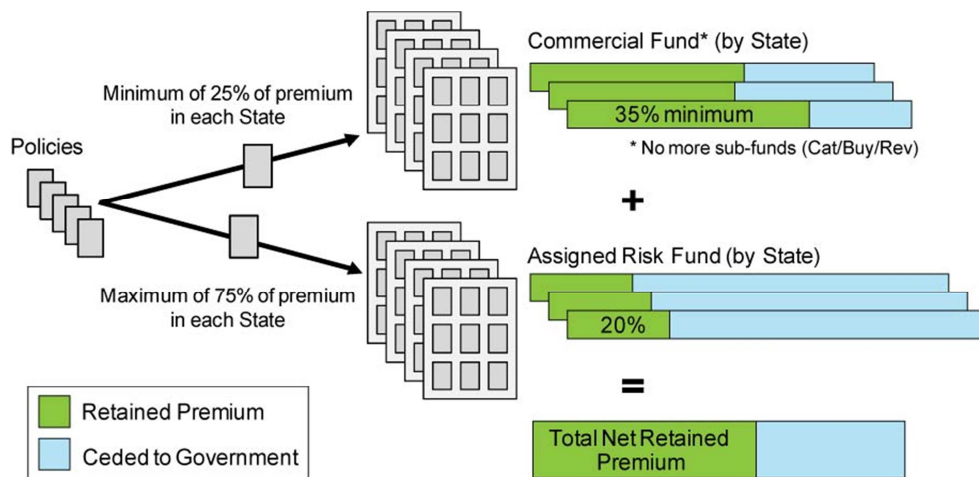
## Fund Designation and Risk Retention

Under the previous SRA, crop insurers allocated individual policies to one of three state-level funds: Assigned Risk, Developmental, or Commercial. Within each of the latter two, there were three subfunds for three types of policies: CAT (minimum yield coverage), Buy-up (yield coverage above the minimum), and Revenue (revenue protection covering combined yield and price risk). This established seven distinct funds in each of the 50 states, potentially resulting in a total of 350 funds for each company, each with its own reinsurance structure.

The new SRA agreement has reduced the total number of potential funds per state from seven to two. The Developmental Fund, which had been designed for medium risk policies, has been removed, and the three subfund designations of the Commercial Fund have been removed as well. All policies assigned to the

Commercial Fund in a state will be evaluated for gain or loss sharing with the government as a single entity, instead of individually for each of the three subfunds.

As shown in Figure 4, each policy is designated by the insurer to either the Assigned Risk (for the riskiest policies) or the Commercial Fund. In each state, the maximum that can be designated to the Assigned Risk Fund is 75% by premium in that state. In the previous SRA, the maximum percentage varied by state. Once the policies have been designated to a fund, the crop insurer then decides how much risk to retain for each state-level Commercial Fund, subject to the rules. The crop insurer must retain 20% of the Assigned Risk Fund in each state. This percentage previously varied by state over a small range. For the Commercial Fund, the crop insurer may choose to retain a percentage from 35% to 100% of premium. The retained premium by state and by fund is used to generate the estimated underwriting gains and losses in the AIR MPCl Model.

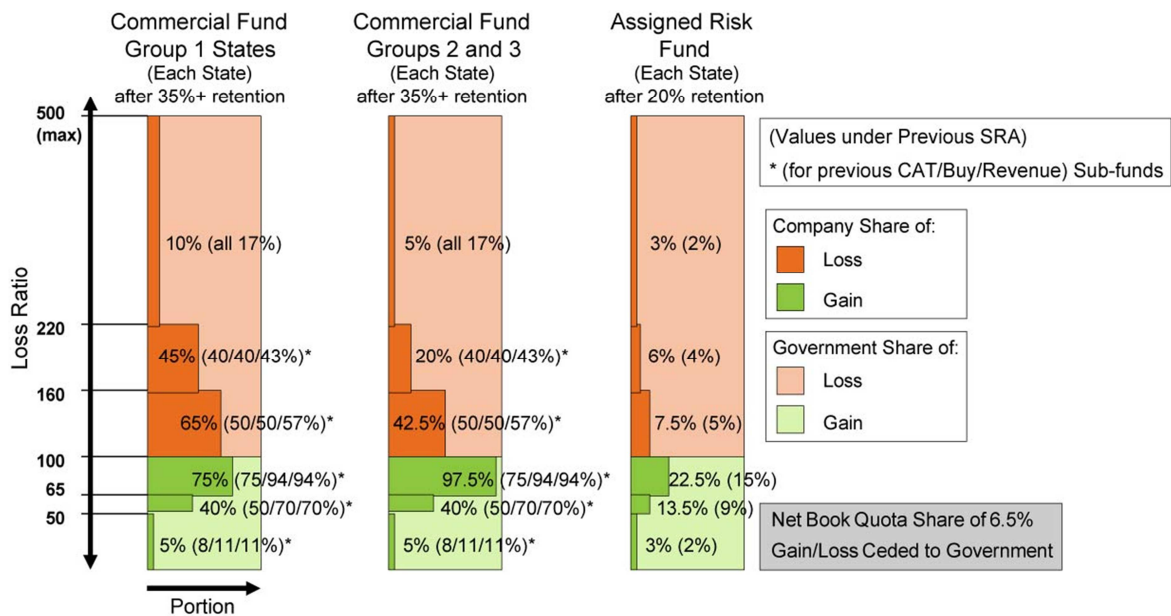


**Figure 4. New 2011 SRA Fund Allocation Rules**

## Sharing of Underwriting Gains and Losses

The gain/loss sharing mechanism has also changed in the 2011 SRA. As in the previous SRA, the sharing of gains and losses from the retained premium between the crop insurer and the government varies by the performance of each fund in each state, with the measure of performance being the loss ratio. A loss ratio less than 100% is an underwriting gain; a loss ratio above 100% is a loss. A comparison of crop insurer share percentages under the new and old SRA is shown in Figure 5.





**Figure 5. Changes to Insurer's Share of Retained Gain/Loss (values under the previous SRA are shown in parentheses)**

For the Commercial Fund in the new SRA, the sharing is different for Group 1 states than for Groups 2 and 3. In Group 1, the portion of any gains between loss ratios of 65 to 100 are shared as follows: 75% to the insurer, 25% to the government. Previously, the crop insurer kept 75% for the CAT subfund and 94% for the Buy-up and Revenue subfunds. As discussed above, these subfunds no longer exist. For the portion of any gain representing a loss ratio below 65, the crop insurer keeps 40%, substantially less than under the old SRA.

With respect to losses, the crop insurer now keeps a larger share in Group 1 states, except for any portion of the loss that exceeds 220% of premium where the share is now lower. For Group 2 and Group 3 states, the crop insurer keeps more of the gains (except that portion that corresponds to loss ratios of less than 50) and less of the loss than under the old SRA.

For the Assigned Risk Fund, for the 20% fixed premium retention, the crop insurer retains more gain and more loss, though the percentages shared by the insurer are small.

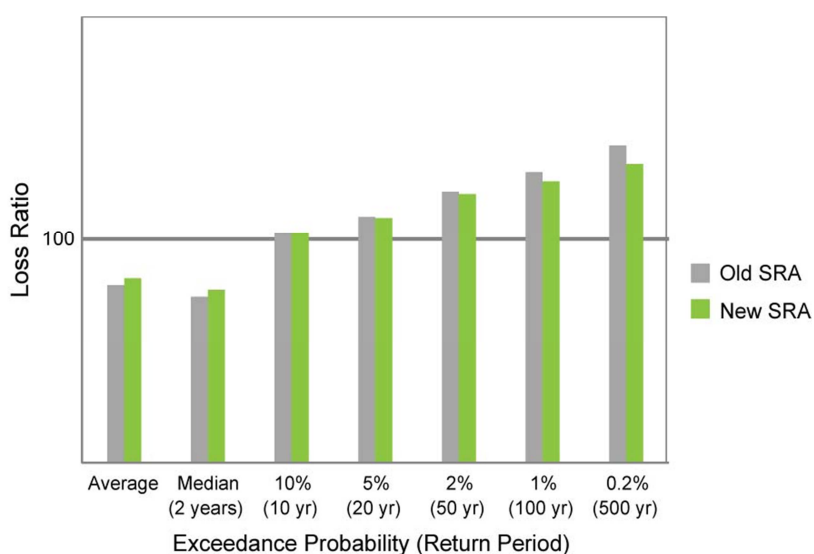
The final gain/loss sharing calculation is the Net Book Quota Share (modeled in AIR software as coinsurance), which applies to the combined net gain or loss across all funds and states. The new Net Book Quota Share is set at 6.5%, compared to 5% previously, with 1.5 percentage points of any underwriting gain to be distributed to those companies that service policyholders in 17 Group 3 states. Gains and losses after the Net Book Quota share represent the exposure offered in the private reinsurance market.

## Impact of SRA Changes on Modeled Losses

AIR compared the modeled loss ratios under the old SRA with those under the new SRA using the updated AIR MPC I Model. That is, the results in both cases reflect the updated historical data, including industry

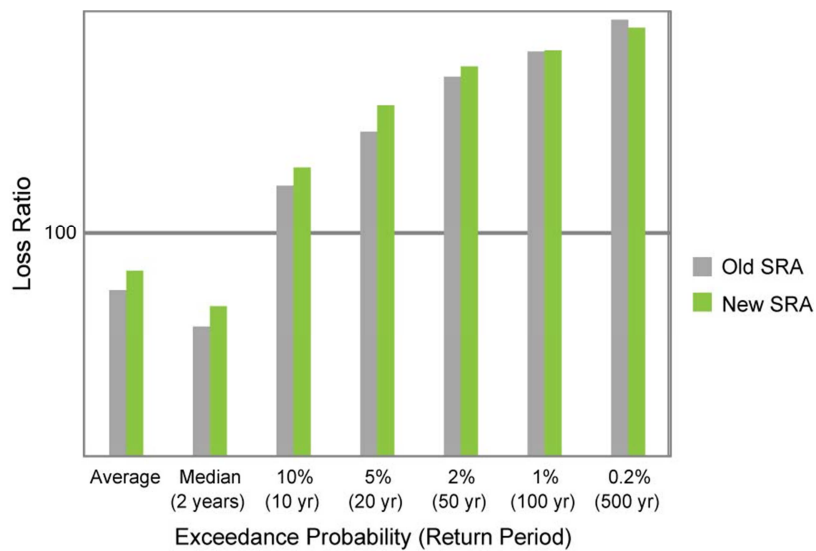
exposures, and enhancements to the AIR MPC I Model as described above. For the new SRA, all policies previously in the Developmental Fund are assumed to be transferred to the Commercial Fund.

Figure 6 shows the change in industry loss ratios, post-SRA, for the entire United States. Nationwide, the industry benefits from a diversity of climate, weather, and crops. With the incorporation of the new SRA in the modeled results—in particular, with the new risk sharing rules and regulations—the (long term) average annual loss ratio is higher, which means lower underwriting gains for the industry. At the 50% exceedance probability (2-year return period), which is the median year (half of the years are better and half are worse), the loss ratio is also higher, which again means less gain for the industry. There is little change in loss ratio for the 10% to 5% exceedance probabilities (10-year to 50-year return periods). At lower exceedance probabilities (higher return periods), there is a reduction in loss ratios. Thus the new SRA results in lower gain potential as well as some reduced exposure to risk.



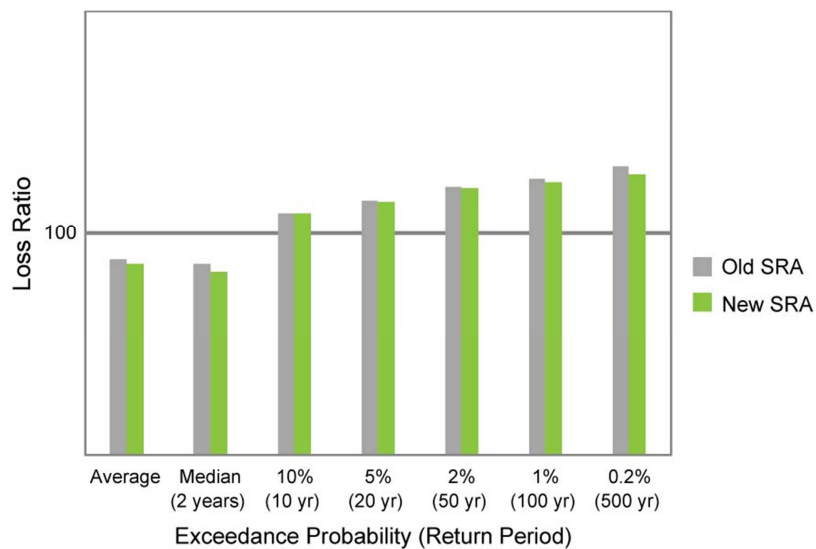
**Figure 6. Impact of 2011 SRA Change – Total U.S.**

The analysis above is for a fully diversified portfolio as represented by the entire industry. In practice, however, very few crop insurers have exposures that mimic those of the industry as a whole. As previously mentioned, insurers have historically flocked to the Group 1 states. Figure 7 compares performance under the old and new SRA for a single state in Group 1, Illinois. As intended by the government, there is a substantial increase in loss ratio for the profitable years (as indicated by the average annual and median year loss ratios), which represents a substantial reduction in the average underwriting gain. There is increased loss at lower exceedance probabilities up to the 1% (100-year) level, but a slight reduction in loss at the 0.2% exceedance probability (500-year return period).



**Figure 7. Impact of 2011 SRA Change – Illinois**

Figure 8 shows the change in loss ratios for Texas, a Group 2 state, which the RMA has targeted for increased profit potential and reduced risk of loss. The model results show a slight decrease in loss ratio for the average annual and median year values (slightly increased profit). There is little change in risk of loss, however, except at the lower exceedance probabilities, which do see a slight reduction in loss ratios.



**Figure 8. Impact of 2011 SRA Change – Texas**

## Conclusion

Because several of the changes to the 2011 Standard Reinsurance Agreement are structural, the usefulness of historical loss experience data for estimating crop insurance underwriting gains and losses for the upcoming year— which was limited to begin with— is yet further diminished. Results from the AIR Multiple Peril Crop

Insurance Model indicate that, in general, companies with exposure in Group 1 states should expect reduced gain and higher losses, while companies with exposure in other states should expect higher gains with little change in loss potential.

However, typical crop insurance programs consist of multiple states in varying market shares. Each individual crop insurer's program will experience different changes in exceedance probabilities depending on their individual market share by state, mix of policy types written, portion of policies designated to the Assigned Risk Funds by policy type, and the amount of premium retained in the Commercial Funds.

For the 2011 crop year, the AIR Multiple Peril Crop Insurance Model has been updated with the most current data and has been reprogrammed to calculate the conditions of the new SRA for analyzing crop insurer programs, stop-loss and quota share reinsurance programs, and portfolios of reinsurance programs. AIR's industry-standard CATRADER® application provides program analysis for all MPCl crop insurer reinsurance submissions and complete, multi-program portfolio loss analysis (see the [AIR Multiple Peril Crop Model Brochure](#) for a more detailed description of the model). Results from the AIR MPCl model allow crop insurers to make better decisions in fund allocation and retention level strategies to better manage this complex risk.

## About AIR Worldwide

AIR Worldwide (AIR) is the scientific leader and most respected provider of risk modeling software and consulting services. AIR founded the catastrophe modeling industry in 1987 and today models the risk from natural catastrophes and terrorism in more than 50 countries. More than 400 insurance, reinsurance, financial, corporate, and government clients rely on AIR software and services for catastrophe risk management, insurance-linked securities, detailed site-specific wind and seismic engineering analyses, agricultural risk management, and property replacement-cost valuation. AIR is a member of the ISO family of companies and is headquartered in Boston with additional offices in North America, Europe, and Asia. For more information, please visit [www.air-worldwide.com](http://www.air-worldwide.com).